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December 20, 1996
WCC Project 91C7343-1

Mr. Brian Mitchell
U.S. Environmental Protection Agency
Iowa RCRA and State Programs Branch
Air, RCRA, and Toxics Division
726 Minnesota Avenue
Kansas City, Kansas 66101

Re: Facility at 3200 Main Street, Keokuk, Iowa
Proposed Groundwater Monitoring Plan

Dear Mr. Mitchell:

Enclosed are two copies of a proposed groundwater monitoring plan for the Facility at 3200 Main Street in Keokuk, Iowa. The plan addresses the vicinity of the Former Underground Solvent Product Tanks and the Secondary Solvent Source Areas.

The plan is submitted on behalf of United Technologies Automotive Systems, Inc. (UTAS). If you have any questions about the submittal, please direct them to Mr. Rick Meyer at UTAS. He can be reached at (860) 728-7586.

Very truly yours,

David A. Dods
Senior Project Engineer

encl.

cc: Rick Meyer, UTAS
Joseph Gregg, Esq., Eastman & Smith
Harold Gibson, Schlegel
Dale Guariglia, Esq., Bryan Cave

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GROUNDWATER MONITORING PROGRAM

FACILITY AT 3200 MAIN STREET KEOKUK, IOWA

Prepared for
United Technologies Automotive Systems, Inc.
Hartford, Connecticut

December 20, 1996

Woodward-Clyde

Woodward-Clyde Consultants
10975 El Monte, Suite 100
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Project No. 91C7343-1

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DRAWINGS AND EXHIBITS

APPENDICES

This document presents a proposed groundwater monitoring program for areas known as the Former Underground Solvent Product Tanks and the Secondary Solvent Source Areas at the Facility at 3200 Main Street in Keokuk, Iowa. This document describes the scope of work, procedures, and analytical protocol for the groundwater monitoring program. The program draws on information gathered from numerous investigations conducted to-date at the facility. Drawing 1-1 illustrates the facility location.

1.1 PROJECT BACKGROUND

The former underground solvent product tanks were removed in 1989. At that time, it was observed that product had leaked from some or all of the tanks. Since that time, the tanks have been the subject of numerous investigations, which were completed in 1992. In the same general vicinity, other potential solvent source areas were the subject of investigation under a RCRA Facility Investigation (RFI) that was conducted between 1993 and 1995. In the RFI, those areas were referred to as the "Secondary Solvent Source Areas."

Solvents from the tanks and secondary source areas have been identified in shallow fill material and in underlying groundwater in the upper native till soils.

The investigations for the former underground solvent product tanks and the RFI have been completed, and United Technologies Automotive Systems, Inc. (UTAS) has proposed to EPA to install a Soil Vapor Extraction (SVE) system to remove the solvent source in the shallow fill material. UTAS has discussed with EPA negotiating a Consent Order to govern the operation of the SVE system. It is anticipated that the Order will be negotiated in 1997.

In discussions with EPA, UTAS agreed to perform groundwater monitoring concurrent with operation of the SVE system. This document describes the proposed groundwater monitoring program.

1.2 OBJECTIVES AND SCOPE OF GROUNDWATER MONITORING PLAN

It is anticipated that remediation of the contaminant source area will also have a beneficial impact on the underlying groundwater quality over time. Given that the former solvent product tanks have been removed, previous investigations indicate that the contamination is contained on-site, and the SVE system is being installed to remove the solvent source, the objectives of the groundwater monitoring program are the following:

- Evaluate current groundwater conditions to provide a baseline prior to startup of the SVE system
- Monitor groundwater quality changes over time as the solvent source area is remediated using the SVE system
- Confirm that contamination is not migrating off-site

The following tasks will be performed as part of the Groundwater Monitoring Program:

- Repair damaged groundwater monitoring well covers and redevelop the wells prior to sampling.
- Collect and submit for chemical analyses groundwater samples from each of the existing monitoring wells prior to startup of the SVE system.
- Collect and submit for chemical analyses groundwater samples from selected monitoring wells on an annual basis after startup and operation of the SVE system. Monitoring will continue for three years after shutdown of the SVE system. It is anticipated that this will equate to a minimum of five years of groundwater monitoring.
- Annually conduct inspections and well depth measurements to ensure the wells are physically intact.
- Provide the USEPA with analytical results and interpretation of the annual sampling events.

The groundwater monitoring program will utilize the monitoring wells numbered MW-1 through MW-21, whose locations are illustrated on Drawing 1-2. All wells will be sampled for the baseline sampling event. After reviewing the results of that sampling event, UTAS will propose to EPA an abbreviated list of wells to monitor on an on-going basis. It is anticipated that some of the shallow wells will be virtually dry once the SVE system dewaters the fill material, and will not provide sufficient water to sample. Additionally, if analytical results and the location of some wells suggest that they are not monitoring areas of contamination, they may be proposed for deletion from the on-going monitoring program.

2.1 GROUNDWATER SAMPLING

The groundwater monitoring wells will be sampled prior to startup of the SVE system, then annually thereafter. Sampling will be performed on the schedule outlined in Section 7. Water level measurements will also be performed concurrently with sampling of the monitoring wells. Water level measurements will be made using a water level indicator or similar device. Readings will be made from the reference point (v-notch) on the top of the well.

Monitoring wells will be sampled in order of least to most contaminated to minimize the chances of cross contamination.

The general sampling procedures that will be used to collect groundwater samples are summarized below:

1. Approach the well from an upwind direction, obtain, and record an air quality reading at the well head (with cap off) and in the breathing zone. The field team may continue to work in modified Level D personal protection if the air quality reading does not exceed the action level set in the Site Health and Safety Plan.

2. Check the well for damage.

3. All equipment used during development will be decontaminated using the procedures in Section 2.4.

4. Measure and record the depth from the V-notch in the top of the well casing to the top of water in the well casing with an electronic water level indicator. Measure the total depth of the well relative to the top of casing. Calculate the height of water column (feet) and standing volume (gallons) of water in the well based upon known well installation details or measured total depth of well.

5. Wells will be purged using decontaminated stainless steel or teflon bailers.

6. After each well volume of water is removed, a water quality sample will be collected and analyzed for pH, temperature, and conductivity. Purging will continue until three parameters stabilize to within 10 percent or the well is bailed dry.

7. As soon as water quality parameters stabilize, groundwater samples may be collected using a stainless steel, teflon, or disposable bailer. Historic results indicate that many wells will be bailed dry and will require a period of time to recover. Samples will be collected within 24 hours of well purging. Parameters will be considered stabilized if the field measurements between water quality samples deviate by less than 10 percent of previous reading values.

   Number samples and label containers as described in Section 4.0 and Tables 3-1 through 3-3 .

   Fill the Volatile Organic Analysis (VOA) vials such that a meniscus is formed on the rim of the vial and carefully cap the bottle. Tip the bottle upside down, tap on capped end, and

inspect for air bubbles. Should noticeable air bubbles appear, repeat the process until an air-free sample is obtained.

9. Place the samples in a secure shipping container after decontamination of the outside of the sample bottles.

10. The information listed in Section 4.1.2 should generally be recorded on the sample collection field sheet.

11. Rèplace well cap and lock protective casing.

12. Complete all field documentation and chain-of-custody records for each sample according to Section 4.0.

13. Decontaminate the outside of the sample containers.

14. Check container lids and tighten if necessary.

2.2 HANDLING OF PURGE WATER

Groundwater purged from the monitoring wells prior to sampling will be contained, moved to a central location at the Facility, and treated prior to discharge. The collected purge water will either be sent through the SVE water treatment system or a small-scale (two 55-gallon drums) activated carbon filtration system.

2.3 REPAIR OF DAMAGED GROUNDWATER MONITORING WELLS

2.3.1 Replacement of Damaged Monitoring Well Covers

Many of the groundwater monitoring wells at the Facility are located in active, paved areas of the plant or parking lots. These wells are flush-mounted with no secondary protection. Some of the flushed-mounted well covers and manholes have suffered damage from trucks and snowplows and therefore, are in need of repair or replacement.

Each monitoring well will be inspected and an assessment made of the repairs required. Each damaged monitoring well cover will be repaired prior to initiating the groundwater monitoring program. The tops of a few wells may actually be damaged. In this event, the damaged PVC will be cut off and a new extension installed using a compression fitting. The extension will be cut to an appropriate height and the well resurveyed. Damaged flush-mount covers will be replaced with heavy-duty covers and regrouted at the surface. Each monitoring well requiring repair will be redeveloped prior to sampling.

2.3.2 Well Redevelopment

Following repair of a monitoring well cover, the well will be developed again to remove material that may have been introduced into the well during repair operations. Development will take place no sooner than 24 hours after completion of final grouting, if any, to allow the grout around

the flush mount to develop adequate strength. Development will be performed by pumping or other means approved by the field coordinator.

Water removed from the wells during development will be drummed and handled with other purge water as described in Section 2.2.

The following procedures will be used for well development:

1. Approach the well from an upwind direction, obtain, and record air quality reading at the well head (with cap off) and in the breathing zone. The field team may continue to work in modified Level D personal protection if the air quality reading does not exceed the action level set in the Site Health and Safety Plan.

2. Check the well for above-ground damage.

3. All equipment used during development will be decontaminated using the procedures in Section 2.4.

4. Measure and record the depth from the V-notch in the top of the well casing to the top of water in the well casing with an electronic water level indicator. The water level indicator will be calibrated against a steel tape measure, or equivalent, before and after the field work. Measure the total depth of the well relative to the top of casing. Calculate the height of water column (feet) and standing volume (gallons) of water in the well based upon known well installation details or measured total depth of well.

5. Prior to pumping or bailing, the well will be surged. If a pump is used for development, lower the decontaminated pump into the well. Begin pumping after the unit is submerged. Raise and lower the pump through the screened interval periodically while pumping. The pump should rest close to the bottom of the well near the end of the development process. If a bailer is used, bail the well from the bottom of the screened interval using the bailer to frequently surge the well prior to bringing the bailer to the surface.

6. Development will continue until at least 10 well volumes have been removed or reasonably clear water is drawn from the well. After a minimum of three well volumes of water is removed, a sample will be obtained for pH, temperature, and conductivity field tests. Development will continue until three consecutive field tests taken a minimum of one well volume apart, have stabilized (i.e., within 10 percent). Five-gallon buckets will be used to determine the total volume of development water removed from the well. Water removed from the well will be containerized for future discharge through the SVE water treatment system or an activated carbon filtration system. Noticeable odors, discoloration, presence of turbidity or sediment content should be noted and described on the field sheet or field notebook.

7. Additional surging, with approval of the supervising geologist, may be required to suspend sediment and thus allow sediment removal from the well if greater than 6 inches of sediment is measured in the bottom of the well.

8. Upon completion, record the following information on the appropriate field sheet or in the field notebook:

   - Date and time of start of well development;
   - Initial water level;
   - Total depth of well;
   - Well development method;
   - Volume of water removed;
   - date and time of well development completion;
   - Field parameters; and
   - Appearance and odor of water.

2.4 DECONTAMINATION

Decontamination of personnel and equipment will be performed to limit the transport of contaminants off-site and between work areas. Personnel decontamination protocols are discussed in the Health and Safety Plan. All sampling equipment coming in contact with groundwater will be decontaminated prior to sampling, between sampling locations, and at completion of the work. This will minimize the potential for cross-contamination.

Decontamination of equipment will occur at the exclusion zone of the intrusive activities and at a main decontamination station. Small sampling and field equipment will be cleaned at the exclusion zone, while a central decontamination station will be established for large tools and other large items.

Small equipment will be decontaminated using the following procedures:

1. Scrub with brush using Alconox detergent (or its equal) and potable water solution.

2. Heavy rinse with potable water.

3. Distilled water rinse.

Decontaminated equipment will be stored on clean polyethylene sheeting or wrapped in aluminum foil or plastic bags between uses. Following decontamination, the sampling equipment will not be allowed to touch the ground surface prior to use.

Large equipment will be decontaminated using the procedures outlined below.

1. Move equipment to decontamination station after sampling/field activities are complete.

2. Decontaminate equipment using a high pressure steam cleaner with a soap cycle and water cycle. Scraping and scrubbing may be necessary to remove encrusted material. Items should be placed on sawhorses, pallets, or the equivalent to prevent contact with the ground.

3. Place equipment on polyethylene sheeting, sawhorses, or clean pallets and allow to dry.

Sampling and intrusive field equipment must not contact the ground surface prior to the next sampling location. Wrap sampling equipment in polyethylene sheet or plastic bags and secure as needed.

Water collected from decontamination operations will be treated through the SVE water treatment system or a small-scale activated carbon filtration system, in a manner similar to the well purge water.

Groundwater samples from the monitoring wells collected in association with each sampling event will be analyzed for volatile organics and field parameters. The analytical parameters and methods are summarized in Table 3-1.

Table 3-2 presents the number of samples to be collected plus the number of quality control samples to be analyzed for each sampling event. The sampling activities will include the following procedures for purposes of quality control:

- Sampling of the upgradient wells first
- Collection of 10 percent field duplicates
- Collection of one matrix spike/matrix spike duplicate for volatile organics
- Inclusion of one trip blank in each volatiles shipment.

Table 3-3 presents the sample containers, preservatives, and holding times.

All samples will be shipped via overnight carrier to a certified laboratory for analyses, except for those analytical protocols which are performed in the field. At the laboratory, the Chain of Custody (COC) procedures will continue until chemical analysis is complete. In addition to the QA/QC samples collected in the field, the laboratory will complete quality control analyses as required by the specific analytical method.

Upon receipt of the analytical results, a Contract Compliance Screening will be performed on the data to assess the adequacy of the data. Section 5.2 describes the screening process.

4.1 FIELD DOCUMENTATION

Documentation of field and sample collection activities will include the use of field logbooks, field sheets, sample labels, and Chain-of-Custody (COC) forms. Additionally, a well completion log will be prepared for monitoring wells needing repair. Example forms for field documentation are included in Appendix A.

Errors made during field documentation in the logbook, field sheet, sample label, or chain-of-custody will be crossed out with a single strike mark, initialed, and dated.

4.1.1 Field Logbooks

Bound field logbooks with sequentially numbered pages will provide the means of recording pertinent field activities performed or observations made. Since field activities are often quite diverse, the field logbook entries must be in sufficient detail that the sampling situation or field activity can be reconstructed at a later date.

Particular items recorded in the logbooks include pertinent aspects of sample collection, field measurements, health and safety documentation, and field management. Typical logbook entries generally include:

- Project name and number
- Date and time of activities
- Personnel present
- Current weather conditions
- Description of field activities, including sample medium, location, and number
- Air monitoring readings, as appropriate
- Health and safety information, as appropriate
- General field observations
- Photographs taken
- Recorder's signature

Field logbooks will become part of the project file upon completion of each sampling event.

4.1.2 Field Sheets

To supplement the information recorded in logbooks, a field sheet will be completed for each sample or set of samples collected. Field sheets provide detailed information on the samples collected. Examples of the information recorded on field sheets are listed below:

- Project name
- Project number
- Date

- Well number
- Personnel present
- Sample number
- Nature of any visible well damage
- Air quality readings
- Water level before purging (depth below top of casing)
- Time began purge
- Time end purge
- Water level after purging (depth below top of casing)
- Approximate volume of water removed during purging
- Sample time
- Temperature
- Conductivity
- pH
- Preservation, if applicable
- Other data as required

4.1.3 Sample Labeling

A sample numbering system will provide a tracking mechanism to allow retrieval of the sample, sample information, and sampling location. Each sample collected will be identified by a unique number as described in this section. It is imperative that each sample collected for analysis be clearly identified with a sample label. Each sample container will be labeled with the following information:

- Project name and number
- Sample number
- Date and time of collection
- Analysis requested
- Sample preservation, as appropriate

The numbering system used to allow tracking of sample information and positive identification of sample results will consist of two components: the sample type and the sampling location.

Groundwater samples will be numbered using an alpha-numeric code of the groundwater monitoring well identification number. Groundwater duplicate samples will be given an artificial number to distinguish them from primary samples.

Example:	MW-2		
	MW	=	Monitoring well
	2	=	Well number

All rinsate samples collected will be identified by an "R" added to the last component of the sample number. The sample number will be the number of the last sample collected before the rinsate sample. The matrix spike/matrix duplicate containers will be identified as such on the sample label and chain-of-custody record.

4.1.4 Chain-of-Custody

Each cooler of samples collected and shipped to an analytical laboratory will be accompanied by a chain-of-custody (COC) record. The primary purpose of the COC procedure is to document the possession of the samples from collection through storage and analysis to reporting. COC forms become the permanent record of all sample handling and shipping.

The field team is responsible for the care and custody of the samples collected until the samples are transferred to another party, dispatched to the laboratory, or disposed. The Field Manager is responsible for enforcing COC procedures during field work. This responsibility may be delegated to a records custodian at the discretion of the Field Manager.

The chain-of-custody procedures are provided below:

- Prior to sample packaging and shipment, the chain-of-custody form is completed for the sample collected.
- When the form is full, or when all samples have been collected that will fit in a single cooler, the Field Manager, Field Team Leader, or Records Custodian will check the form for possible errors. Corrections are made to the record with a single strike mark and initialed. All entries will be made in blue or black ink. Each cooler will be accompanied by a separate chain-of-custody.
- A shipping bill is then completed and the shipping bill number recorded on the COC.

When transferring custody of the samples, the individuals relinquishing and receiving custody of the sample shipping container will document the sample shipping container transfer by signing and dating the COC. This process documents sample custody transfer from the sampler, usually through an express courier, to the analyst in the contracted analytical laboratory. The COC will reflect transfer of the shipping container to an express courier with the bill of lading serving the purpose of the COC until receipt of the shipping container by the analytical laboratory.

A copy of each chain-of-custody form is retained by the sampling team for the project file and the original is sent with the samples. In conjunction with data reporting, the analytical laboratory will return the COC or a copy of the COC to the WCC Project Manager for inclusion into the central project file.

4.2 PACKAGING AND SHIPPING PROTOCOL

This section describes packing and shipping procedures used for environmental samples collected at the Site.

All samples will be classified as environmental and must be packaged using the following procedures:

1. Check all labels for legibility and accuracy -- replace labels if necessary.
2. Ensure that all labels are covered with wide, clear cellophane tape to protect labels during shipping.
3. Visually check the outside surface of the containers for proper decontamination. If any containers appear to be soiled, decontaminate again.
4. Check all container lids and tighten if necessary.
5. Wrap sample containers with foam packaging material to prevent breakage during shipping.
6. Place sufficient packaging material in bottom and around the sides of the shipping cooler. Line the cooler with a plastic trash bag.
7. Place wrapped samples in the lined cooler. Complete and check COC forms during packaging following the protocol in Section 4.1.4.
8. Add ice to the cooler in quantities adequate to maintain 4° C temperature during shipping. Ice should be placed in zip-lock type plastic bags.
9. Tie or tape closed the plastic trash bag holding the samples.
10. Fill excess space in cooler with packaging material to prevent movement of the sample containers. Styrofoam beads, peanuts, or other packaging material may be used.
11. Contact the field team leader, sample coordinator, or his/her designee to review the COC paperwork and the sample packaging before proceeding.
12. The paperwork which accompanies the samples to the laboratory is placed inside a plastic bag, sealed, and taped to the inside of the cooler lid.
13. The following markings are placed on the top of the cooler:
14. "This End Up" labels or arrows
15. Total quantity of coolers in shipment (i.e., 2 of 4)
16. Shipper's name and address
17. The cooler is closed and sealed with filament tape in a manner to prevent inadvertent opening during shipment.
18. A custody seal will be placed on the cooler in an area that would indicate if tampering had occurred.
19. A completed label for shipping by express carrier is attached to the top of the cooler.

Call express carrier to arrange pick up of the coolers, or deliver to the nearest carrier's office.

4.3 MONITORING WELL MAINTENANCE

Repair and replacement of monitoring well covers will be documented in the field logbook and with a photograph. Documentation of well redevelopment will utilize the form provided in Appendix A.

5.1 DATA MANAGEMENT PLAN

Data collected will be documented by various methods. Field observations and sampling activities will be recorded using field sample sheets, log books and periodic photographs. Samples will be tracked utilizing sample identification numbers, labels, and chain of custody forms.

Technical data collected from non-field activities will include, but not be limited, to the following:

- Calculations performed
- Key telephone conversations
- Correspondence

These data may be documented by telephone memoranda, computer printouts, or computer files on diskettes or tape. Data collected from other sources will be properly referenced.

Project documentation will be maintained and controlled through an organized project filing system. Data and documents will be labeled with the project number and file number on at least the first page. Original documents will be marked as such and placed in the appropriate master file location.

Files will consist of general files and technical files. General files will consist of the following:

- Management information
- Financial information (i.e., contracts)
- Correspondence
- Other (e.g., newspaper articles)

Technical files will contain the majority of the work generated during the Groundwater Monitoring Program. These files consist of all data and work products generated during the Groundwater Monitoring Program including the following:

- Project plans
- Field log books
- Field sample sheets and chain-of-custody records
- Photographs
- Analytical data packages
- Calculations
- Data review notes
- Progress and technical reports
- Other pertinent information

The data will be organized in a numerical task-by-task order.

5.2 DATA REVIEW

After completion of each field event, chemical data provided by the analytical laboratory will be reviewed and evaluated. This review will ensure that only scientifically sound data are used in preparing reports and monitoring trends.

There will be two levels of data review for the purpose of ensuring valid data. The first review level will be done at the analytical laboratory in accordance with the laboratory's quality assurance plan. The second level of review will be performed by WCC as an external check of the adequacy of the laboratory quality assurance program.

WCC will perform a contract compliance screening of all data to include reviewing the results of summary sheets, chain-of-custody forms, MS/MSD results, surrogate results, holding times, blanks, reporting units and limits, laboratory control samples, and holding times.

5.3 ANALYSIS AND REPORTING OF SAMPLING DATA

Analytical results will be submitted to the USEPA within 60 days of receipt of all analytical data from the laboratory. Analytical results will be evaluated in the following ways:

- Concentrations of VOC's compared to historical data for each well
- Concentrations in upgradient wells versus downgradient wells
- Concentrations of parameters with respect to distance from the source area and to property boundaries
- Concentrations of parameters over time, decreasing or increasing, at each well

The results will be presented in tabular and diagram formats in an annual groundwater monitoring report. The report will include the following:

- Summary analytical results in table format to include all compounds detected for each well. Results over time will be presented for each well.
- Water level measurements from the monitoring wells
- Water table contour map
- A narrative describing the effects the SVE system is having on surrounding groundwater quality and any changes made or maintenance needed in the monitoring network
- Site plan drawings with analytical results plotted for each well to include total VOCs and a minimum of the four most prevalent individual compounds. Due to the extended list of analytes, it is proposed to graphically present selected, rather than all, constituents.
- Results of activities required by the well monitoring maintenance plan (Section 6.0).

A monitoring well maintenance plan is included as part of the Groundwater Monitoring Program to ensure that all monitoring points remain reliable. The plan includes the following items:

- Annually conduct well depth measurements to ensure wells are physically intact and not filling with sediment.
- Annually inspect all wells, in particular flush-mounted wells in traffic areas, to ensure the wells are not damaged.
- An examination of the water level measurements to assess that the selected wells in the monitoring program are providing accurate information of groundwater flow within the plume.

If monitoring wells are filled with excess sediment, they will be redeveloped. If wells are damaged, they will be repaired. Well integrity will be questioned if well damage prohibits the introduction of sampling equipment, water quality indicator parameters do not stabilize during well purging prior to sampling, or water levels are anomalous and unexplained. If a well's integrity is called into question, we will discuss an appropriate response with EPA. This might include well repair, abandoning, or replacement.

The Groundwater Monitoring Program will be implemented upon USEPA approval and within one month prior to startup of the SVE treatment system at the Facility. The first annual round of groundwater sampling will occur within twelve months after startup of the SVE treatment system. Sampling will then be performed on an annual basis.

Annual sampling will continue for three years following shutdown of the SVE system. If at that time, the constituent levels do not demonstrate a statistically significant increase, and no contamination is migrating off-site, UTAS will eliminate the groundwater monitoring requirements.

Analytical results will be received within approximately four weeks following sampling. An annual report summarizing the effect the SVE remedy is having on groundwater quality will be completed and submitted to USEPA within 60 days of receipt of all analytical data from the laboratory.

TABLE 3-1
ANALYTES, ANALYTICAL METHODS, AND TARGET DETECTION LIMITS

Analytes	Analytical Method	Target Detection Limit
Volatiles		
8240 Method Analyte List	SW846 8240	Compound specific MCLs
Hexane	SW846 8240	Not available
n-Butyl Alcohol	SW846 8240	Not available
Isobutanol	SW846 8240	200 µg/l
Field Parameters		
pH		
Temperature		
Conductivity		

TABLE 3-2
NUMBER OF SAMPLES AND QUALITY CONTROL REQUIREMENTS PER SAMPLING EVENT

Sample Type	Sample Number	Duplicates	Trip Blanks[1]	Matrix Spike	Matrix Spike Duplicate	Total Sample Number
Groundwater	25[2]	2	3	1	1	32

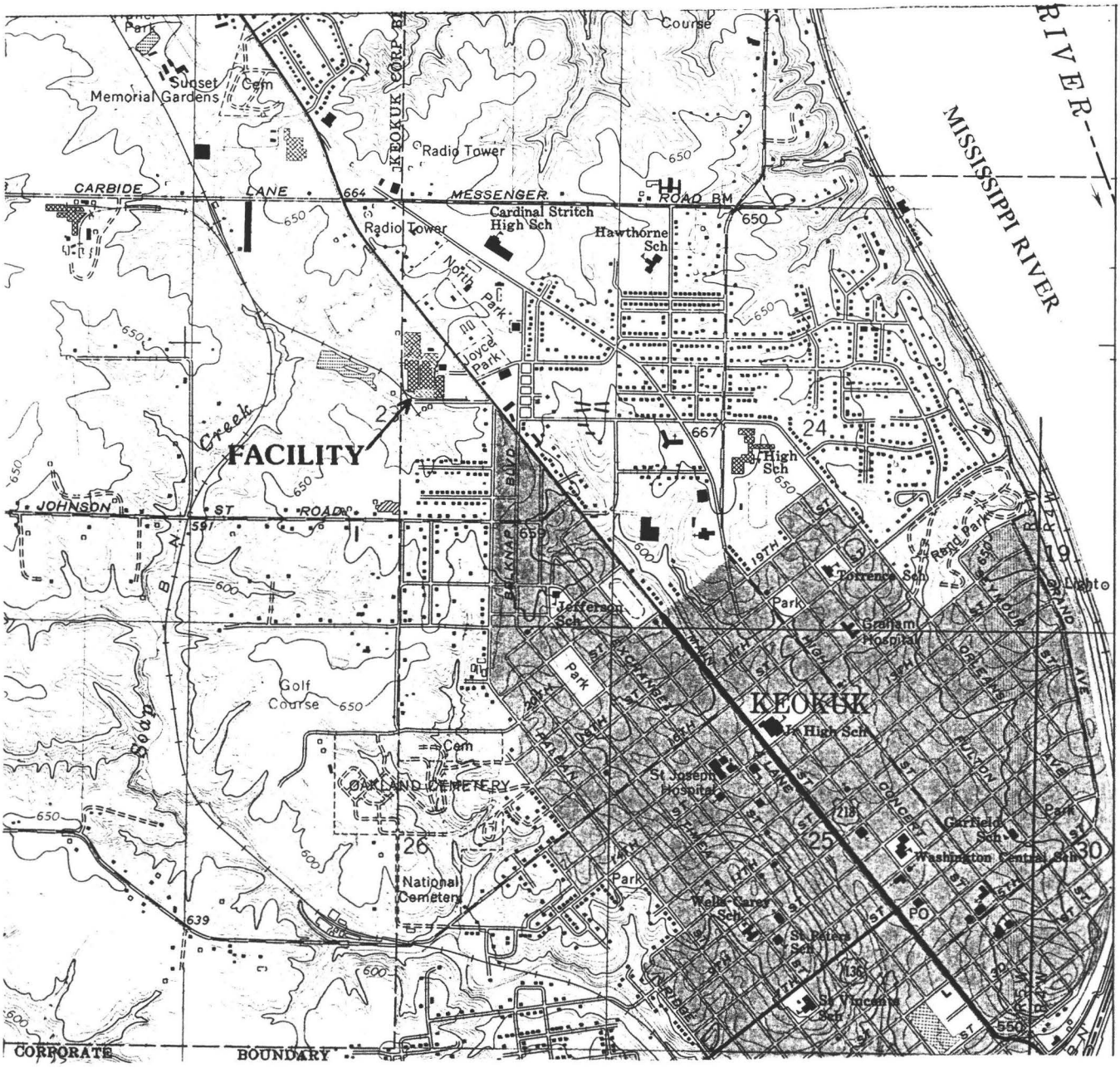
1 Trip blank analyzed for volatiles only. Estimated number of samples; one sample per shipping container.

2 This represents the number of samples during the first sampling event. The number may change with EPA concurrence for subsequent events.

TABLE 3-3

SAMPLE CONTAINERS, PRESERVATIVES, AND HOLDING TIMES

Parameter	Containers	Preservation	Holding Time Period
VOCs, Hexane, n-butyl alcohol, Isobutanol	3 x 40 ml vials with teflon lined septa	HCl (pH < 2), 4°C	14 days



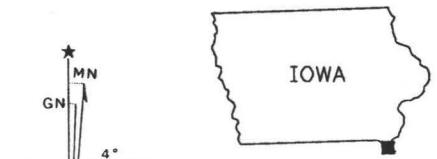
SCALE 1:24000

1 MILE

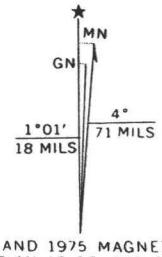
7000 FEET

1 KILOMETER

CONTOUR INTERVAL 10 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929



QUADRANGLE LOCATION



UTM GRID AND 1975 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET

FACILITY AT 3200 MAIN STREET
KEOKUK, IOWA

Woodward-Clyde Consultants
Engineers, Geologists, And Environmental Scientists

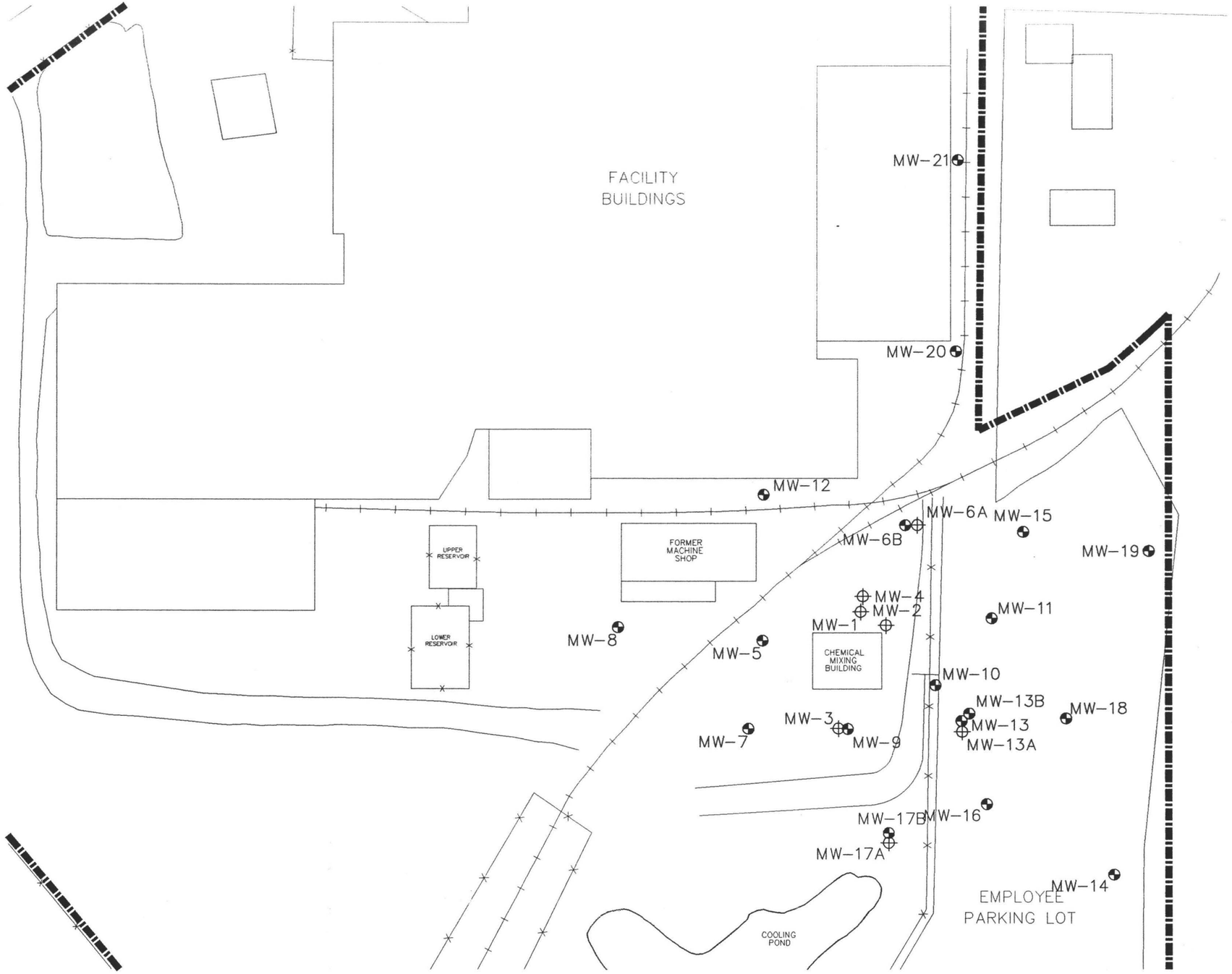
FACILITY LOCATION MAP

DRAWN: D.R.T.	DATE: 11/08/93	PROJECT NUMBER	DWG. NO.
CHECKED: CJF	DATE: 11/17/93	91C7343-1	1-1

ACAD FILE:

ACAD 12_clo
11/08/93 11:02:39

D.R.T. SC: 1=1



LEGEND:

- FACILITY PROPERTY LINE
- RAILROAD TRACKS
- FENCE LINE
- EXISTING FILL MONITORING WELL
- EXISTING TILL MONITORING WELL

NOTE:
ALL SOIL BORING MONITORING WELL LOCATIONS ARE APPROXIMATE.

N

50 0 50 100

SCALE FEET

FACILITY AT 3200 MAIN STREET
KEOKUK, IOWA

Woodward-Clyde Consultants
Engineers, Geologists, And Environmental Scientists

GROUNDWATER MONITORING PROGRAM
MONITORING WELL LOCATIONS

DRAWN: D.R.T.	DATE: 02/28/95	PROJECT NUMBER	DWG. NO.
CHECKED: DRD	DATE: 12/19/96	91C7343	1-2

ACAD FILE:
ACAD 12_c4
02/28/95 16:10:35
December 13, 1996 12:41:51 p.m.
Drawing: J:\UTC\UTC-25.DWG
D.R.T. SC: 1=600

APPENDIX A Field Documentation Forms

WOODWARD-CLYDE CONSULTANTS
10975 El Monte, Suite 100
Overland Park, Kansas 66211
(913) 344-1000

SAMPLE COLLECTION FIELD SHEET - WATER SAMPLES

PROJECT NAME: _____ PROJECT NUMBER: _____

SAMPLE NUMBER: _____ PERSONNEL: _____

_____

LOCATION DESCRIPTION _____

SAMPLE MEDIA (circle one): GROUNDWATER SURFACEWATER OTHER: _____

SAMPLE SPLIT (circle one): YES NO : SPLIT SAMPLE NUMBER: _____

WATER LEVEL: _____

WATER LEVEL MEASUREMENT FROM TOP OF RISER PIPE: _____

COLLECTION: YR: ____ MO: ____ DAY: ____ TIME: ____ METHOD: _____

SAMPLE CONTAINER	PRESERVATIVE	ANALYSIS REQUESTED

FIELD ANALYSIS

TEMPERATURE, °C _____ DATE _____

SAMPLE pH _____ TIME _____

SALINITY, PARTS PER THOU _____ APPEARANCE _____

CONDUCTIVITY, umhos/cm _____ ODOR _____

pH BUFFER BEFORE _____ pH BUFFER AFTER _____

COMMENTS _____

_____

DEVELOPMENT/PURGING

DATE _____ CASING DIAMETER _____

WATER LEVEL BEFORE _____ WELL DEPTH (SOUNDED) _____

WATER LEVEL AFTER _____ TIME STARTED _____

EST. VOLUME REMOVED _____ TIME COMPLETED _____

HNu/OVA, BACKGROUND _____ METHOD _____

HNu/OVA, WELL HEAD _____ HNu/OVA, BREATHING ZONE _____

COMMENTS _____

_____

M.A.L. ACAD 12_c1a
1=1
08/11/94 13:23:57

ACAD FILE: SCFSDWG

Well Development Data Sheet

Site name: _____ Well number: _____

Project number: _____ Date _____

Total depth of well: _____

Depth to water: (measured from top of casing) _____

1 Well volume: _____ 2 Inch well: 0.17 X _____ = _____ (Gallons)
(water column, ft.)

4 Inch well: 0.66 X _____ = _____ (Gallons)
(water column, ft.)

Number of casing volumes to be removed: _____

_____ X _____ = _____ (Total number of gallons to be removed)
(# volumes) (1 casing vol.)

Method of well development: _____

Date	Time	Volume Removed	Conduct-ivity	Temp-erature	pH	Turbidity	Comments

Additional Comments: _____